

Lake Anne Village Center
Parking and Transportation Study

FINAL REPORT



submitted to:
Department of Planning and Zoning
County of Fairfax, Virginia

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Introduction

Fairfax County is undertaking a comprehensive planning process for revitalization of the Lake Anne Village Center, and the Washington Plaza area specifically. Previous planning studies (most recently the March 2007 Basile Baumann Prost and Associates, or BBPA, report) defined the key objectives of the revitalization process, outlined a development program as a target for future growth, and highlighted the marketing and urban design steps necessary to achieve the vision.

The County wishes to explore the implications of recommending increased quantities of new development as envisioned in the BBPA report. The purpose of the current project is to prepare the technical analyses that will frame key issues and inform the County's stakeholders about decisions relative to moving some parking underground, realigning certain roadways, and making improvements to the pedestrian and bicycle networks.

Purpose of this Report

The purpose of this report is to:

- Summarize technical information regarding existing parking and the roadway, bicycle and pedestrian network in the Lake Anne Village Center. Initial work focused on collecting surface and subsurface, utility, traffic and parking data to serve as the basis for planning in future tasks.
- Present an analysis of site conditions, highlighting key issues that will affect construction of underground parking, access improvements, and air rights development.
- Provide an assessment of access and parking options. This work included analyzing the recommendations in the BBPA report and determining the engineering and economic feasibility of providing structured parking in the vicinity of the current surface parking lot north of the Washington Plaza.
- Recommend access and parking concepts. Describe rationale behind the overall parking, roadway, bicycle and pedestrian circulation network recommendations in the Village Center.

Planning Context

After reaching its economic peak in the 1970s, commercial activity and the physical condition of the Lake Anne Village Center have declined steadily. The first round of revitalization efforts was launched in 1983 with preparation of the Lake Anne Village Center Historic District justification. Throughout the 1980's and 1990's the County and local stakeholders undertook a wide range of revitalization activities, including:

- Establishing the Lake Anne Village Center Historic District,
- Designating the Lake Anne Village Center Revitalization area,
- Analyzing economic and market conditions,
- Convening public meetings and a visioning process and formalizing the development vision for the Village Center,
- Appointing the Lake Anne Village Center Comprehensive Plan Text Amendment and Design Guidelines Technical Advisory Panel (TAP), and
- Undertaking a study that made recommendations for an amendment to the Fairfax County Comprehensive Plan (the BBPA work).

The conclusions and recommendations of the BBPA effort provide the planning context for the current work. Key consensus planning principles were as follows:

- Create long-term development vision to ensure economic stability and address regional competition
- Realize Reston Master Plan Lake Anne vision
- Preserve Historic Core
- Increase residential population base
- Introduce mixed use adjacent to Washington Plaza
- Enhance pedestrian and vehicular circulation

The Village Center Historic Overlay District is of particular relevance to the current effort because any new development must conform to its design guidelines. The overlay district standards and guidelines range from the most global, such as preserving the spatial qualities of the district, to the very fine-grained, such as maintaining original architectural finishes. The design review process for development in the district is likely to be quite rigorous.

Description of the Study Area

The study area for the existing conditions report and the subsequent concept development efforts comprises the areas in and around the Lake Anne Village Center. Concepts for future parking structures will focus on the existing parking area just north of Washington Plaza, in the area bounded by North Shore Drive and Washington Plaza. Analysis of the overall transportation network covers a larger area, looking at not just North Shore Drive, Village Road and the Washington Plaza area, but also some of the major surrounding roadways, such as Baron Cameron Avenue and Wiehle Avenue.

Figure 1 on the following page provides an aerial image of the study area.



Image Source – Google Earth
Figure 1 – Project Study Area

Building on earlier efforts such as the BBPA report and design charrettes, this report will document the baseline conditions for the core of the Village Center, defined in the BBPA report as the “Inner Ring Policy Area,” specifically Sub Areas 1 through 5. Within these sub areas the team focused on collecting data, including documentation of the existing geology, utilities, hydraulic, and hydrologic conditions (centered mainly on Sub Area 1), transportation (covering Sub Areas 1 through 5 and the surrounding area), and other pre-existing site conditions. The figure below shows the sub areas defined in the BBPA report.

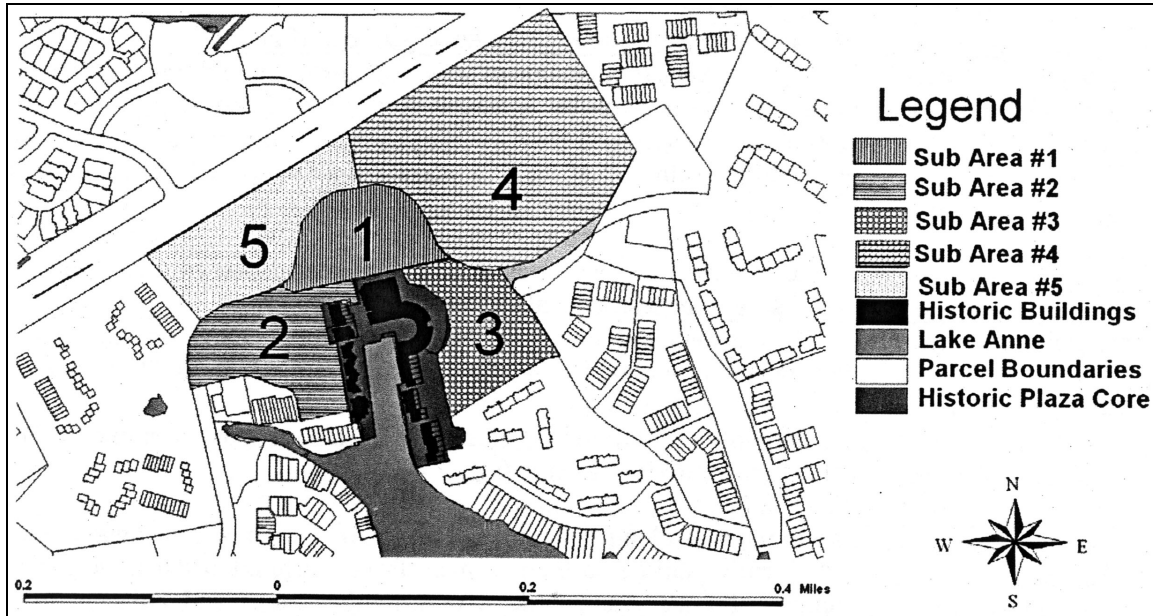


Figure 2 – Study Area with Sub Areas from BBPA Report

Following is a summary description and BBPA’s development recommendations for each sub area.

- **Sub Area #1** -- This sub area, which includes the parking area to the north of Washington Plaza, will receive the most attention in the current effort. In the BBPA report this area was the primary expansion zone for the Village Center. The report recommended that this be an urban mixed use activity center organized around a north-south pedestrian corridor flanked by ground level retail and office/residential above. It was to be designed to have both low- and high-rise structures in both residential and office uses. A Floor Area Ratio (FAR) of 2.1 was envisioned, excluding structured parking, with low-rise housing types (3 to 4 stories) as the density minimum. Parking was envisioned as being below grade. Most of this sub area is within the “Lake Anne Village Historic Overlay District” and the two structures in this sub area are considered as “contributing properties.” It was proposed that the ASBO building, at the northern end of the parking lot at the Village Road and North Shore Drive intersection, would be demolished.
- **Sub Area #2** -- This sub area lies to the west of the buildings around Washington Plaza. This area was to be built out with residential and commercial infill (re)development that connects the western Lake Anne Village Center residential clusters with Washington Plaza. An FAR of approximately 1.25 was envisioned, with mid-rise housing types (4 to 8 stories). A very small portion of this sub area, in the northeast corner, is within the “Lake Anne Village Historic Overlay District.”
- **Sub Area #3** -- This sub area lies to the east of the buildings around Washington Plaza. This area was to be built out primarily with residential development. It will also serve as the

pedestrian link between development in Sub Area #4 and Washington Plaza. An FAR of 2.1 was proposed for this area, with the possibility of a high-rise tower (14 stories) surrounded by low-rise residential structures (3 to 4 stories).

- **Sub Area #4** -- This sub area lies north of North Shore Drive and east of Village Road. This area is slated for a range of residential building types, from one high-rise (14 stories) structure and various forms of attached housing. An FAR of 2.0 was envisioned.
- **Sub Area #5** -- This sub area lies north of North Shore Drive and west of Village Road. The area was to be built out with residential uses primarily, with a baseline FAR of 1.6, but up to an FAR of 3.4 under certain circumstances.

Organization of This Report

The following sections of this report describe the existing conditions data gathered and the assumptions made and methods used during the development and analysis of parking and transportation options, and provides recommendations regarding preferred parking, transportation and transit options.

The existing conditions section includes:

- Brief description of the parking structure site
- Brief summary of access and transportation conditions
- References to the Existing Conditions Report for more detailed information

The analysis and assessment section includes:

- Description of project requirements considered during the development of parking and transportation concepts
- Description of assumptions made and options analyzed regarding roadway concepts
- Description of assumptions made and options analyzed regarding parking structure concepts

The recommendations section includes:

- A preferred roadway configuration and access concept
- Recommendations regarding future transit operations
- Positive and negative aspects of each parking concept

EXISTING CONDITIONS

The Lake Anne Village Center Parking and Transportation Study Existing Conditions Report and its appendix provide a large amount of information regarding the existing conditions in the project area. While that report may be used as a reference, the following sections highlight a few of these conditions with regard to the parking structure site and the overall transportation network.

PARKING STRUCTURE SITE

As described previously, the study area for the overall Parking and Transportation Study encompasses the area surrounding Lake Anne and Washington Plaza; however, assessing the feasibility of providing structured parking at the Lake Anne Village center focused on the existing parking lot north of Washington Plaza. The following sections focus specifically on this existing parking area and the areas immediately adjacent to it.

Description of Project Site

General

The existing parking lot north of Washington Plaza at the Lake Anne Village Center comprises an area measuring roughly 350 feet east-west and 300 feet north-south. The parking lot is bounded by North Shore Drive to the north, east and west, by Washington Plaza itself to the south, and by Washington Plaza North and a small parking lot to the southwest. The lot serves the businesses in and around Washington Plaza.

Figure 3 on the following page highlights many of the existing elements described below.

Access

Access to the existing parking area is provided via two points on North Shore Drive. An entrance to the lot exists at the northeast corner of the parking area and is restricted to incoming traffic. Most traffic accessing the parking area from the west via North Shore Drive or from the north via Baron Cameron Avenue and Village Road use this northern entrance, and the entrance itself is located about 70 feet east of the intersection of Village Road and North Shore Drive.

A second entrance exists at the eastern edge of the parking lot and provides access to both entering and exiting traffic. Most traffic accessing the site from the east via North Shore Drive use this access point as opposed to the northern entrance, and all traffic leaving the site must leave via this exit.

Buildings

The existing parking area is bounded on the south by the buildings of Washington Plaza. These include the northern edge of the former Safeway location now being used for the TLC 4 Kids Children's Center, the Reston community center and other small establishments, and the northern edge of the Millennium Bank. While both of these buildings sit adjacent to the parking lot, the entrances to the businesses are from the plaza that extends from the parking lot to the center of Washington Plaza and the lake.

The northern edge of the parking lot is anchored by a two-story office building occupied by the Association of School Business Officials (ASBO). On the eastern side of the parking lot is the small 24-7 Express Market and Mercado Latino, which sits just north of the eastern entrance to the parking lot from North Shore Drive.

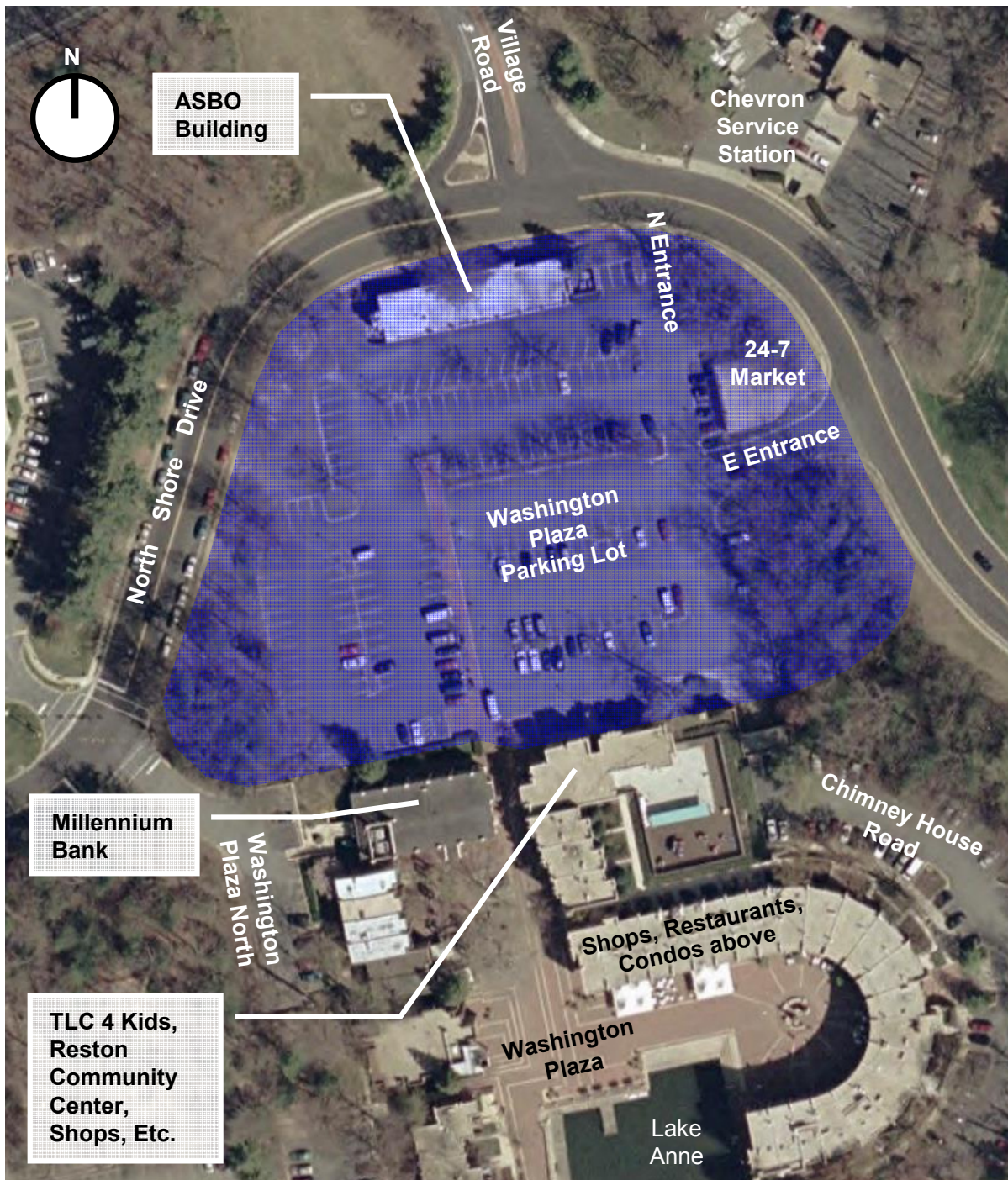


Image Source – Google Earth
Figure 3 – Project Site Area

Potential parking structure site shown shaded in blue.

Parking

The existing parking lot provides approximately 223 spaces that are used by employees of and visitors to the businesses that sit on the parking lot and the businesses and other uses that are located on Washington Plaza itself. The latter category includes restaurants and shops, the Millennium Bank, and the Washington Plaza Baptist Church.

Pedestrian Access

Pedestrian access to the Washington Plaza area is provided via various routes, which are discussed in more detail later in this report in the Transportation section. However, some key pedestrian access elements include sidewalks along North Shore Drive, and stairways leading to the Washington Plaza area from Chimney House Road and the parking area behind the Washington Plaza Baptist Church.

Property Ownership

The Existing Conditions Report includes a list of property owners and figures showing the parcels and easements in the project area. Properties in the project area are owned by a combination of private parties, the Lake Anne of Reston Condominium Association, and the Reston Home Owners Association. Multiple easements exist on the project site, including storm sewer and sanitary sewer easements; water line easements; and electric, telephone and cable easements. Surrounding the project site are the right-of-way for North Shore Drive and Village Road and a few large parcels owned by various entities.

Lake Anne Historic District

Many of the parcels described above fall within the Lake Anne Village Center Historic Overlay District. This district was created in 1983 after several elements of the original Lake Anne Village Center design were lost during redevelopment efforts. As described in the BBPA report and in the Fairfax County Zoning Ordinance, the purpose of this district is to:

- Protect against the destruction of the historic and architectural quality of the landmark
- Encourage uses which will lead to its continuance, conservation and improvement
- Assure that new uses within the district will be in keeping with the character to be preserved and enhanced

Geology, Topography and Soils

Geology and Soils

The Existing Conditions Report contains detailed information on the geology of the project area.

Site Topography

The original topography in the entire study area has been disturbed by urban development related to excavation and grading for construction of buildings, streets, and roadways. The topography is characterized by rolling terrain intersected by moderate slopes.

With regard to the specific project site, the existing parking area north of Washington Plaza generally sits lower than the roadways that surround it. The parking lot generally slopes down from east to west.

Groundwater

Groundwater elevations within the study area were not measured. A review of the historic records and available information suggest that the water elevations for any excavation may be near the surface at the lower end of the site near Lake Anne, and follow the average Lake pool elevation across the entire study area.

Subsurface Investigation via Refraction Microtremor (ReMi) Survey

To augment the data gathered from existing sources, a refraction microtremor, or ReMi, survey field investigation was conducted on the project site. ReMi survey uses standard refraction seismic equipment to measure subsurface soil and/or rock characteristics.

The subsurface exploration program consisted of four survey lines located along the perimeter of the potential parking garage and away from the existing storm water and sanitary sewer lines that run roughly in a north-south direction through the middle of the site.

The results of the ReMi survey indicated that throughout most of the site, rippable or marginally rippable material – material that can be excavated by means other than hoe-ramming or blasting – is present to a depth of approximately 25 feet to 30 feet, with bedrock below that.

Natural Resources

Wetlands

Though a formal wetland investigation was not performed, there are not any known wetlands on the project site or in the immediate vicinity. The project site is almost completely built out, and the areas that are still vegetated have fairly steep slopes and do not exhibit any typical wetland vegetation.

Natural Drainage Channels and Bodies of Water

There are no natural bodies of water on the project site. Lake Anne and Lake Newport are both man-made lakes, and they are connected via a box culvert that crosses under Baron Cameron Avenue and North Shore Drive.

Drainage

Storm Sewer

Storm drainage systems in and around the project site drain to Lake Anne. A series of storm drain inlets is located along North Shore Drive on the perimeter of the project site, and these inlets are connected by a series of storm sewer pipes that converge at the northern edge of the existing parking area near the ASBO Building.

The parking lot is generally sloped to the southwest and water is collected in a series of grate inlets that are spaced in a line running north-south through the parking lot. These inlets tie to the box culvert that connects Lake Newport to Lake Anne (described in the next section).

Box Culvert

As mentioned previously, a box culvert runs from Lake Newport to Lake Anne. This 7'x9' concrete box culvert starts at a paved flume just north of Baron Cameron Avenue, then runs west of Village Drive, eventually passing through the project site and ending at the northern end of Lake Anne. The roadway drainage system along North Shore Drive ties into this box culvert, as does the Washington Plaza and Washington Plaza North parking lot drainage systems.

Due to the size of this box culvert and the relatively limited space available for its relocation, the design for an underground parking structure on the project site sought to avoid moving this structure. In addition, the design of the foundations for any above-ground parking structures or buildings will also need to avoid this drainage structure.

Hazardous Materials

The project site and the surrounding area have remained basically unchanged since the construction of the Lake Anne Village Center and nearby roads in the late 1960s. None of the historical plans collected make any mention of hazardous materials on the project site, and no other information has been found that would suggest that hazardous materials are present on the project site.

Utilities

The Existing Conditions Report contains detailed information on the utilities present on the site.

TRANSPORTATION

The following sections provide a brief description of the transportation network in the study area.

Existing Roadway Characteristics

Network Description

The roadway network surrounding the Lake Anne Village Center includes several major and local roadways, as shown in Figure 4. Below is a brief description of the key roads in the study area.

North Shore Drive (SR 4726)

North Shore Drive is a winding two-lane roadway that serves as a collector road for the local streets surrounding Lake Anne. Running in a horseshoe shape, it intersects with Wiehle Avenue twice. There are several destinations along North Shore Drive including Lake Anne Elementary School, Hidden Creek Country Club, and various residential buildings. Parking for Washington Plaza is directly accessed via North Shore Drive.

North Shore Drive is an asphalt roadway with concrete curb and gutter and on-street parking in many locations; the parking is well utilized during evenings and weekends. The majority of intersections along North Shore Drive are controlled by stop signs on the minor streets, with the exception of signalized intersections at Fellowship Square/Washington Plaza North and both intersections with Wiehle Avenue. The intersection of North Shore Drive and Village Road is a stop condition for all movements except the southbound right-turn movement, where vehicles yield.

Village Road (SR 4725)

The segment of Village Road within the study area connects North Shore Drive to Baron Cameron Avenue. It is a short, slightly curved four-lane divided roadway with asphalt pavement, a brick median, and concrete curb and gutter. The intersection with Baron Cameron Avenue is signalized.

Wiehle Avenue (SR 828)

Wiehle Avenue is a north-south running arterial connecting Dranesville Road and Fairfax County Parkway to the Dulles Toll Road and Sunrise Valley Drive. Motorists traveling to Lake Anne from the east would likely take this roadway to access North Shore Drive. North of Inlet Court and south of Fairway Drive, Wiehle Avenue is a four-lane roadway divided by a grass median. Between Inlet Court and Fairway Drive, it is a four-lane undivided roadway. The intersection with Baron Cameron Avenue and both intersections with North Shore Drive are signalized. The other intersections in the study area are controlled by stop signs on local streets.

Baron Cameron Avenue (SR 606)

Baron Cameron Avenue is an east-west running arterial connecting Fairfax County Parkway and Leesburg Pike. Those traveling to Lake Anne from the west or north would likely take this roadway to access Village Road. At the signalized intersections with Village Road and Wiehle Avenue, there are left and right turn lanes and two through lanes in each direction.

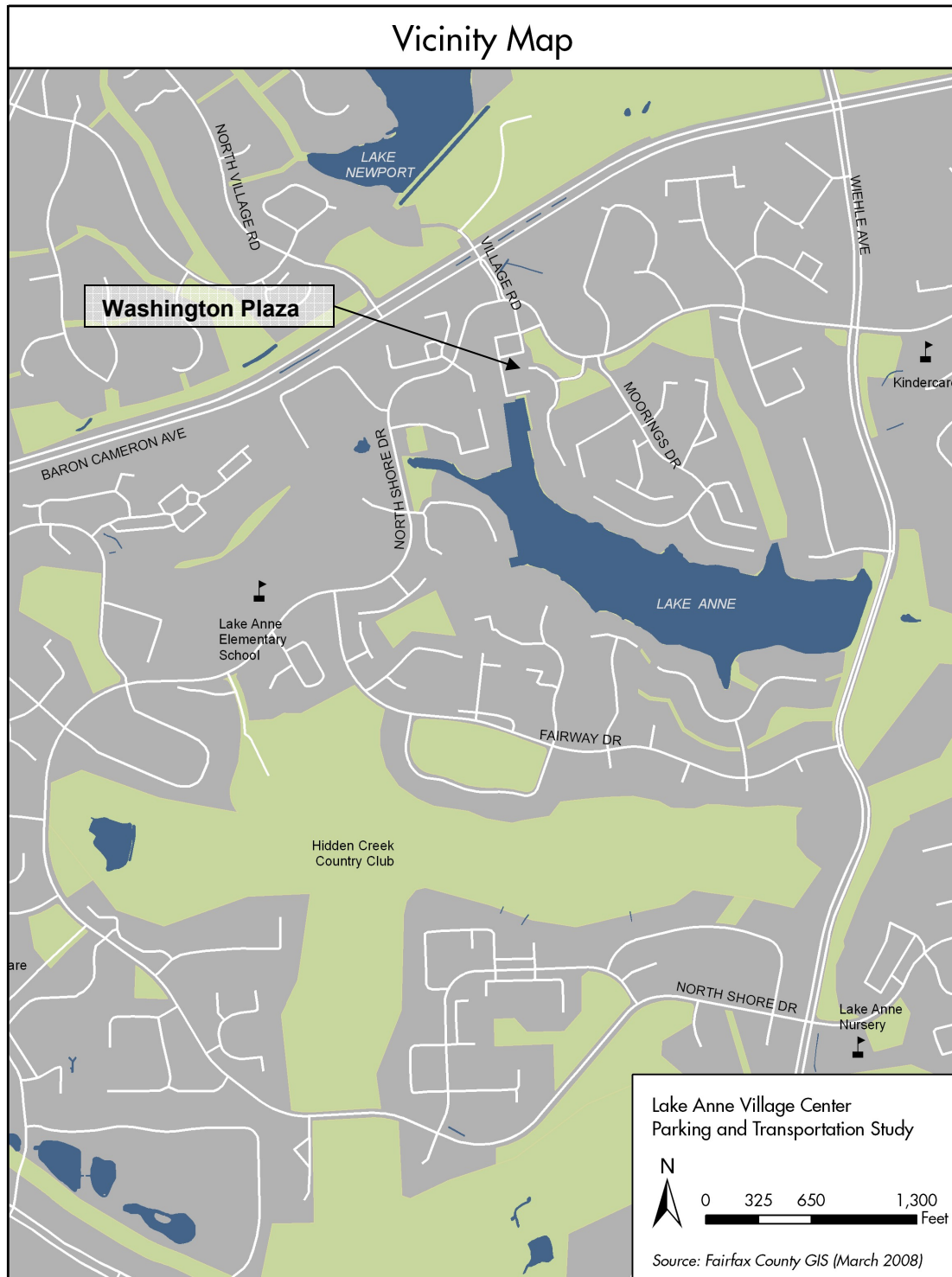


Figure 4 – Study Area Roadway Network

Existing Roadway Issues

The Lake Anne Village Center has two main transportation issues: lack of visibility and lack of roadway connectivity.

Visibility

A motorist turning onto Village Road from Baron Cameron Avenue cannot see the Village Center from the roadway. The ASBO Building, located at the south side of the T-intersection of North Shore Drive and Village Road, almost completely obscures Washington Plaza from view. Visibility is further worsened by the topography of the area; Washington Plaza is several feet lower in elevation than the existing roadways.

Another visibility issue is the horizontal sight distance along North Shore Drive. Because it was intended to be a scenic neighborhood roadway, North Shore Drive winds throughout the study area. As it curves around the Washington Plaza parking lot, the vehicular stopping sight distance is reduced. Because there are bus stops, pedestrian crossings, two entrances to Washington Plaza in close proximity to each other, and turning movements with Village Road in this vicinity, the roadway geometry creates a safety hazard.

Connectivity

Due to the inwardly focused design of Lake Anne, the existing roadway network lacks connectivity within the village. Most of the local roads end in cul-de-sacs; therefore, most trips within the neighborhood require travel on North Shore Drive. Travel is sometimes indirect and is concentrated on only a few roads and intersections. Motorists have few route options to get between destinations.

Transportation Plan

According to the 2006 Fairfax County Transportation Plan (adopted July 2006), there are no improvements planned for the roadways surrounding Lake Anne. Just outside the study area, the Plan includes the proposed widening of Reston Parkway from four to six lanes from Sunrise Valley Drive to Baron Cameron Avenue. Also included in the Plan is the Dulles Corridor Metrorail Project, which would include a station at the intersection of Wiehle Avenue and the Dulles Toll Road.

The proposed improvements in the Plan are not expected to have a major effect on Lake Anne area traffic operations.

Traffic Operations

Volumes and Levels of Service

The Existing Conditions Report contains detailed information on existing traffic volumes and levels of service throughout the study area.

Pedestrian and Bicycle Network

Pedestrian Network

Lake Anne, like many communities in the 1960s, was designed with an intentional separation of vehicles and pedestrians. Many streets have sidewalks, and there is also an extensive network of paved trails throughout the village. North Shore Drive has sidewalks along most of its length, but there are noticeable gaps. In grassy areas where sidewalk is not present, dirt paths have developed over time from pedestrian traffic.

At most unsignalized crosswalk locations, there are signs to warn motorists of the pedestrian crossing. At the signalized intersection with Fellowship Square/Washington Plaza North, pedestrian signals are provided.

Sidewalks are not provided along Wiehle and Baron Cameron Avenues, but there are paved trails paralleling each roadway that give pedestrians and bicyclists access. A pedestrian overpass across Wiehle Avenue is provided at the northern intersection of Wiehle Avenue and North Shore Drive.

Bicycle Network

According to Fairfax County's Existing Trails Map, there are several multi-use trails in the study area. There are numerous off-road, hard surface trails in the study area, including ones paralleling North Shore Drive, Wiehle Avenue, and Baron Cameron Avenue. No on-road bike routes are provided.

Transit Facilities and Services

Bus Facilities and Service

Fairfax Connector provides bus service in the study area via several bus routes. Riders can travel to several popular destinations in Fairfax County including Reston Town Center, Tysons Corner, and West Falls Church Metro. Bus service is relatively infrequent, and some routes travel in the peak commuting direction only. Bus stops are well distributed along North Shore Drive.

According to the Fairfax County DOT, buses are sometimes unable to access the Washington Plaza stop because other vehicles—such as emergency vehicles, loading trucks, and private vehicles—park in the bus stop area.

Passenger Amenities

The type of amenities provided at each bus stop varies by location. A few stops have shelters with benches; some have a concrete pad or sidewalk. However, the majority of stops, especially those along North Shore Drive, do not have sidewalk nearby. Riders must walk in the street or on the grass to access these bus stops.

Ridership

The Fairfax County Department of Transportation collected ridership data in April 2008 for the Fairfax Connector bus routes that service the Lake Anne area. The busiest routes are RIBS 3 and RIBS 4, which connect Lake Anne to the Reston Town Center, the Reston East @ Wiehle Avenue Park & Ride, and Herndon. The busiest bus boarding times are weekdays and Saturdays. According to the Fairfax County DOT, the busiest bus stops in the Lake Anne area are the ones along North Shore Drive near Cameron Crescent Drive, which provide access to the Crescent apartment complex, the gas station, and the small market along North Shore Drive. As previously discussed, this is also where the roadway curvature limits sight distance.

Park-and-Ride Facilities

There are no park-and-ride locations in the study area, but there are two nearby facilities. The Reston North Park-and-Ride is located approximately two miles away from the Lake Anne Village Center, at the intersection of Wiehle Avenue and Sunset Hills Road. The Reston East Park-and-Ride is also approximately two miles away, located near the intersection of Wiehle Avenue and the Dulles Toll Road.

Metrorail

The Washington Metropolitan Area Transit Authority does not provide Metrorail service in the study area. Lake Anne residents can currently access the Metrorail system by taking a Fairfax Connector bus to the West Falls Church Metro Station.

As part of the Dulles Corridor Metrorail Project, a new Metrorail station will be constructed in Reston just two miles away from the Lake Anne Village Center. The proposed Wiehle Avenue station will be located in the median of the Dulles Toll Road, just west of the intersection with Wiehle Avenue.

Safety

In recent years, there have been several pedestrian-vehicle accidents on North Shore Drive, east of the intersection with Village Road. Pedestrians frequently cross there to access the nearby Fairfax Connector bus stop or the Lake Anne Village Center. Pedestrian volumes are particularly high on Saturdays during the Farmers' Market at Washington Plaza. Due to the curvature of the roadway at that location, motorists approaching the intersection do not have adequate sight distance. A pedestrian crossing the roadway can only be seen from a short distance away.

Another safety issue is the lighting in the Lake Anne area at night. According to the results of a community survey published in Reston Association's *Parks, Recreation and Open Space Plan Update*, several residents expressed concern over the lack of adequate lighting. Multiple respondents requested new or additional trail lighting with security being the primary reason for the request.

ANALYSIS AND ASSESSMENT

The following sections describe the basic project requirements that were addressed during the development of parking and transportation options, the assumptions made during the development and analysis of the various options, and a description of the options that were developed. These options were developed in response to the issues and needs identified in the Existing Conditions Report, and all options assume redevelopment of the Village Center to levels envisioned in the BBPA study.

Project Requirements and Assumptions

When developing and analyzing the various parking and transportation concepts, a set of project requirements and assumptions helped guide the process. While some of these were general requirements that applied to the overall development program, others were specific to either the configuration of the transportation network or the structured parking concepts. A list of these requirements and assumptions follows.

General

- Future development levels were assumed to be at the level specified in the BBPA report, which includes a minimum total of 415,000 square feet of mixed use structures that feature predominantly residential (approximately 70%), a maximum of 15% retail and public space at ground level, and approximately 15% office space above ground level.
- A conceptual urban design scheme was developed for the future build-out of the Washington Plaza parking lot area to provide some context for the comparison of the transportation and parking options developed. This scheme was consistent with the vision outlined in the BBPA report. Key features of this scheme that influenced the options development process included:
 - Extending Washington Plaza with a promenade from the existing plaza, through the north parking lot, and to the southern edge of North Shore Drive. This pedestrian promenade will be flanked by ground level retail uses and supported by multiple levels of residential units and office space above and structured parking below.
 - Improve visibility into Washington Plaza from Baron Cameron Avenue. Create a gateway for Washington Plaza by including any or all of the following: (1) realigning Village Road, (2) demolishing the ASBO building, (3) modifying (or demolishing) the existing bank building to widen the entrance into the plaza, (4) constructing the promenade on axis with the north-south portion of existing Washington Plaza, and (5) providing a pedestrian-only zone from Washington Plaza to North Shore Drive.
 - Investigate ways to enhance accessibility for regional and local visitors arriving by car and bus. Provide a multilevel below-grade parking structure to accommodate future parking needs.

Transportation Network

- The future transportation network should work with and provide access to the future development and, to the extent feasible, mitigate the traffic impacts associated with the higher density projected for the Lake Anne Village Center.
- Any reconfiguration of the existing network should address known existing issues or constraints, including:
 - Sight distance concerns along North Shore Drive near the existing north and east entrances to the Washington Plaza parking lot

- Pedestrian access concerns throughout the project area, especially east of the existing parking area where sidewalks are missing along portions of North Shore Drive
- Poor visibility to Washington Plaza from roadways in the project area, especially Baron Cameron Avenue and Village Road
- Bus stops located in areas with poor sight distance (along North Shore Drive) and a lack of bus shelters or other amenities
- Roadway designs should be consistent with the latest VDOT and Fairfax County standards to the greatest extent possible; however, given the age of the road network surrounding the Lake Anne Village Center and the constraints imposed by site topography and existing development, strict adherence to all of these standards may not always be feasible. Factors that were addressed include horizontal curvature, vertical curvature and grades, sight distance, lane widths and uses, and entrance locations.
- The transportation analysis year was 2030. This is consistent with the Metropolitan Washington Council of Government's long-range transportation planning forecast year. While build-out of the Lake Anne Village Center may occur before this time, analyzing the 2030 scenario ensures long-term solutions.
- Existing and 2030 traffic volumes were provided by Fairfax County and were not altered. Figures showing these volumes can be found in the Appendix. Future volumes were the result of trip generation using three different 2030 land use scenarios:
 - Tranplan: Used current Fairfax County land use forecasts. Assumed no major development in Lake Anne.
 - Charrette: Used development levels proposed as a result of the 2005 Lake Anne design charrette. Included a moderate amount of development at Washington Plaza.
 - Option 2: Used development levels proposed in the BBPA report. Included a more aggressive amount of development at Washington Plaza. (Referenced as "BBPA development level" in later sections of this report to avoid confusion with transportation and parking options identified in this study)

Structured Parking

- Parking concepts focused primarily on providing structured parking – above grade or underground – in the existing parking lot north of Washington Plaza. Due to the nature of the future development proposed in the project area, it was felt that purely above grade parking would not be appropriate, so the main focus was on underground, or mostly underground, parking.
- Designs sought to maximize the capacity of the structure within the constraints imposed by future development and existing conditions. Broad concepts from the urban design scheme were incorporated into the designs, such as maintaining an open promenade at grade level as an extension of the existing plaza, though it is important to note that the future design of underground parking on the site will be done in conjunction with the design of the overall development to be constructed above the parking structure, and as such may vary greatly from the concepts shown herein. Incorporating the new development and parking into a comprehensive site design may result in new configurations, different access methodologies, or greater efficiencies than those that can be determined at a purely conceptual level. However, the concepts developed do provide an order of magnitude estimate of the potential capacity and cost of structured parking on the site.
- Parking designs assumed that any changes to the existing topography surrounding the project site would be minor; however, designs did consider greater potential variation in the grades within the existing parking area.

- All parking designs assumed that the existing ASBO building at the north end of the site and the existing 24-7 Express Market and Mercado Latino at the east end of the site would be removed.
- Access to the parking structure was considered for various modes – vehicular (car parking within the structure), vehicular (delivery or service access in or around the structure), pedestrian (accessibility within the structure and around the structure), access during construction. Methods for providing temporary parking during construction were also considered.
- To the extent that they influenced the conceptual designs, building code requirements and considerations regarding structural, geotechnical and utility designs were considered.
- Parking concepts included locations of stair towers and elevators, though these locations would have to be coordinated with the development to be constructed above the parking structure. Accessible parking spaces would need to be provided near the elevators to ensure an accessible route and minimize the distance to be traveled by handicapped users.
- Data gathered during the research for the existing conditions report was considered during the development of the parking structure designs. Some key areas where this data influenced the designs included:
 - Existence of a large box culvert running from north of Baron Cameron Avenue through the project site and ending at the north end of Lake Anne. Given the relatively small size of the project site and limited locations to which this culvert could be relocated, an assumption was made that the culvert would remain in its current location and that the underground parking structure designs would work around it. If a determination is made in the future that this box culvert can be relocated, greater efficiencies can most likely be realized in underground parking designs.
 - With the exception of the box culvert described above, the presence of other site utilities did not influence the design of the parking structure. Standard site utilities such as power, water, cable and telephone will be reconfigured to accommodate the new development and, as such, will need to be reconfigured when the site is redeveloped.
 - Bedrock levels throughout the existing parking area appear to be at an elevation of 25' below existing grade or deeper. Above that elevation, with the exception of a localized area identified during the ReMi survey, removal of existing material should not require blasting or hoe-ramming. Development of project costs assumed higher costs for parking levels that fell within the assumed bedrock layers.
 - The loading dock at the southeast corner of the project site that serves existing business in Washington Plaza should remain accessible during construction to facilitate deliveries and minimize impacts to existing businesses.

Summary of Options Developed

The following sections provide a summary of the transportation and parking options developed and a brief description of the key elements of each. Also included are lists of other options that were considered but not carried forward. More detailed information can be found in the July 2008 Assessment and Analysis of Lake Anne Parking and Roadway Concepts Technical Memorandum.

Transportation Network Options

Two options—each with two variations—were developed in response to existing issues and the likely issues associated with adding density to the Village Center.

Option 1

This option would slightly change the existing street alignments and place parking within the existing parking lot area. This option includes two suboptions—1A and 1B—that have many common elements. These include:

- Realigned Village Road to line up with Washington Plaza entrance. This shift would not only create more of a direct, gateway entrance to Washington Plaza, it would create more space to the northeast for a temporary parking lot.
- Slight realignment of North Shore Drive, to the east of Village Road, to smooth out the horizontal curve and improve sight distance. This would improve vehicular and pedestrian safety.
- Reconfiguration of North Shore Drive, in the vicinity of Washington Plaza, to include one travel lane in each direction, a bike lane in each direction, and six-foot wide sidewalks on either side. Because of this change, the existing on-street parking would be removed. Parking would instead be accommodated in the new structure.
- Improved and accessible bus stops.
- Placement of most parking south of North Shore Drive and north of the Plaza, with a small parking lot located east of the Plaza. Temporary surface parking on the east side of Village Road.
- Grading including fill at the realigned North Shore Drive and Village Road intersection.
- Construction of a retaining wall along the north side of the realignment segment of North Shore Drive at the Crescent property.
- Maintains the existing short distance between Baron Cameron Avenue/Village Road and North Shore Drive/Village Road

This option also includes operational changes to reduce traffic delay and queuing associated with the development presented in the BBPA report. These operational changes include:

- Optimization of traffic signals in the study area.
- Reconfiguration of North Shore Drive and Wiehle Avenue intersection so that the eastbound approach includes one shared left/through/right lane and one right-turn only lane.

Option 1A

Slight realignment of existing network with parking south of North Shore Drive

This option, shown below, would be the smallest change of all options that were investigated, and therefore would have the lowest construction cost.



Figure 5 – Roadway Option 1A

Option 1A would have the following impacts:

- Due to the volume anticipated with the BBPA development scenario, there would be queues along North Shore Drive in the AM and PM peak hours.
- The intersection of North Shore Drive and Wiehle Avenue would be LOS F and D in the AM and PM peak hours, respectively. In particular, the volume of traffic turning from North Shore onto Wiehle is large and would back up into the neighborhood.
- Assuming that the intersection control remained as it is today, North Shore Drive and Village Road would fail in the PM peak hour because of the large volume of traffic traveling southbound and turning left. The queues would likely spill back onto Baron Cameron Drive. Replacing the stop-sign controlled intersection with a roundabout would help with this issue.

Option 1B***Slight realignment of existing network with parking south of North Shore Drive, Roundabouts***

Option 1B includes single-lane roundabouts at the intersections of North Shore Drive with Village Road and with Washington Plaza North instead of standard intersections. Roundabouts would improve traffic operations by providing more efficient flows, particularly for southbound Village Road traffic destined for eastbound North Shore Drive. Vehicles entering the roundabout would yield to vehicles already within it, and the geometry of the roundabout would control the approach speeds. Option 1B is shown below.



Figure 6 – Roadway Option 1B

Pedestrians and bicycles would cross in advance of the roundabout, similar to the figure below.

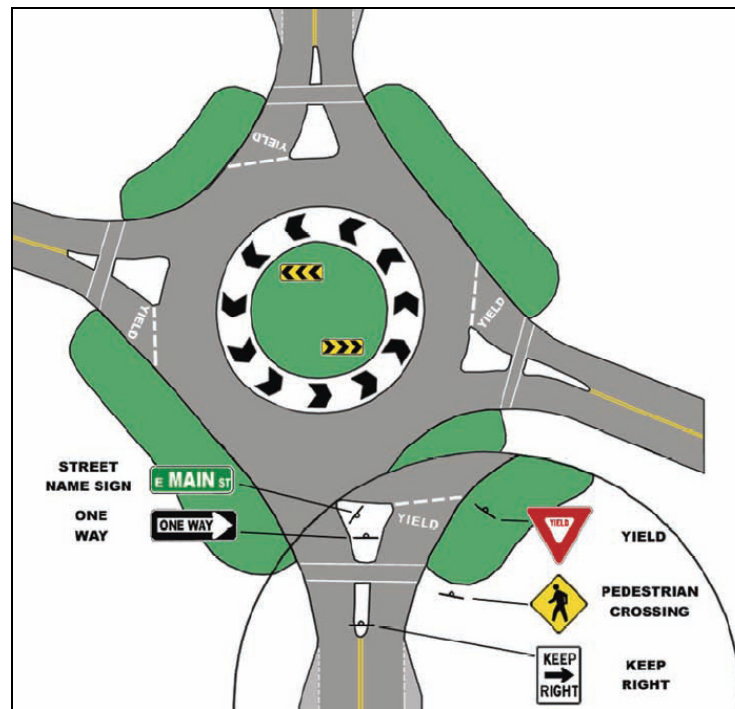


Figure 7 - Typical Roundabout Design (source: VDOT)

Option 1B would have the following impacts:

- Creation of even more of a gateway entrance to the Village Center from Baron Cameron Avenue; the roundabout at the southern end of Village Road would visually anchor the plaza and new development.
- With a roundabout, the intersection of North Shore Drive and Village Road would operate better than in Option 1A and there would be minimal queuing issues towards Baron Cameron Avenue.
- Due to the volume anticipated with the BBPA development scenario, there would be queues along North Shore Drive in the AM and PM peak hours.
- As in Option 1A, the intersection of North Shore Drive and Wiehle Avenue would be LOS F and D in the AM and PM peak hours, respectively. In particular, the volume of traffic turning from North Shore onto Wiehle is large and would back up into the neighborhood.

Option 2

This option would modify the existing street network and change the existing street alignments in a more significant way than Option 1. This option also includes two suboptions—2A and 2B—that have many common elements. These include:

- As in Option 1, a realigned Village Road to line up with the Washington Plaza extension.
- Realignment of North Shore Drive to smooth out the horizontal curve and improve sight distance. This would improve vehicular and pedestrian safety. This realignment would be more significant than in Option 1 and would generally bisect the existing parking lot.
- Grading including fill along realigned North Shore Drive. Grading including fill at the realigned North Shore Drive and Village Road intersection.
- As in Option 1, reconfiguration of North Shore Drive, in the vicinity of Washington Plaza, to include one travel lane in each direction, a bike lane in each direction, and six-foot wide sidewalks on either side. Because of this change, the existing on-street parking would be removed. Parking would instead be accommodated in the new structure.
- The creation of a new intersection at Cameron Crescent Drive and Baron Cameron Avenue. This new intersection would help relieve traffic congestion at nearby intersections (North Shore Drive intersections with Wiehle and Baron Cameron Avenues). To construct this, the Crescent apartment site would need to be regraded to lower its grade approximately eight feet near Baron Cameron Avenue. Because of its proximity to adjacent intersections, the new intersection would be unsignalized and limited to right-in and -out movements. The right-out movement would be stop sign controlled, while the right-in movement would be free flow. This new intersection is shown in the graphic on the following page.
- As in Option 1, improved and accessible bus stops.
- Placement of most parking north of North Shore Drive with a small parking lot located east of the Plaza. Because this roadway option represents a major change in the character of the area and would require further analysis of the development scheme and associated parking strategy, a detailed study into the parking concepts has not yet been undertaken. Temporary surface parking would be provided in a location to be determined.

This option would be a more significant change than Option 1 and would have a higher construction cost. The major realignment of North Shore Drive would improve sight distance even more than Option 1, improving safety. In addition, the intersection of Village Road and North Shore Drive would be moved south, increasing the queuing distance on this roadway. The lengthened Village Road would thus have better vehicular and bus circulation.

The realigned North Shore Drive would bisect the proposed development site and could make the parking configurations more challenging. During construction, pedestrian access to the plaza would be difficult to maintain. However, breaking up the development site in this way could increase street activity and improve circulation throughout the site.



Figure 8 – Cameron Crescent Drive realignment and new intersection with Baron Cameron Avenue.

Option 2A

Realignment of existing roadways and creation of new intersections

Option 2A would include the elements described on page 22, including a T-intersection at Village Road and North Shore Drive. This option is shown below.



Figure 9 – Roadway Option 2A

Impacts of Option 2 include:

- Similar to Option 1, due to the volume anticipated with the BBPA development scenario, there would be queues along North Shore Drive in the AM and PM peak hours.
- As in Option 1, the intersection of North Shore Drive and Wiehle Avenue would be LOS F and D in the AM and PM peak hours, respectively. In particular, the volume of traffic turning from North Shore onto Wiehle is large and would spill into the neighborhood.

With the assumptions previously described, the new intersection at Cameron Crescent Drive and Baron Cameron Avenue would not measurably improve traffic operations as compared to Option 1 (after optimization).

Option 2B

Realignment of existing roadways and creation of new intersection and roundabout

Option 2B would include a single-lane roundabout at Village Road and North Shore Drive. Unlike Option 1B, a roundabout at North Shore and Washington Plaza North is not recommended because of the intersection angles as a result of the North Shore realignment and the proximity to the roundabout at Village Road. Option 2B would have very similar traffic impacts as Option 2A. The new intersection would not improve traffic operations at the surrounding intersections.

Option 2B is shown below.



Figure 10 – Roadway Option 2B

Other Options Considered

Major realignment of North Shore Drive

Previous studies of Lake Anne show North Shore Drive running directly in front of the existing Washington Plaza entrance, completely removing the horizontal curves at the northern end. This option was found infeasible due to topography. Due to the existing grade difference between North Shore Drive and the Plaza, this would include either the decking of North Shore Drive, removing the connection with the Plaza entrance, or very steep grades leading down to the plaza level.

Increased capacity on North Shore Drive

North Shore drive is approximately 40 feet wide and currently consists of one travel and parking lane in each direction. Both Options include maintaining one travel lane in each direction as well as providing bike lanes and wider sidewalks. Widening North Shore drive to two lanes in each direction was not analyzed because while this would increase capacity on North Shore, drivers would face the same bottleneck at the Wiehle Avenue intersection. In other words, that intersection is the choke point, and not the number of lanes on the street.

Transit Options and Considerations

Roadway and parking changes to Lake Anne Village Center create the opportunity for improved transit services and facilities. The timing is appropriate to consider these improvements, as the Fairfax County Transit Development Plan, which will identify five-and ten-year transit system changes, is now being prepared. Lake Anne Village Center's transit needs can be formally considered in this transit planning process.

Enhanced Bus Stops

Bus stops are a key transit system component, directly affecting the comfort and convenience of transit use. But stops are often given inadequate attention in bus system planning.

Enhanced stops could be provided at Lake Anne Village Center at relatively low cost. Passenger waiting shelters could provide a more pleasant environment for transit users. Expanded transit information—maps, schedules, and real-time bus arrival information—could make transit use more attractive. Direct, well-designed walkways between bus stops and the heart of Lake Anne Village Center are necessary not only for convenient, handicapped-accessible access but also to create a visual connection between transit service and the retail and other activities in the village center.

Because of Lake Anne Village Center's history and significance, passenger waiting shelters should be designed to be compatible with the village center's architectural and urban design characteristics. Stop locations and walkways must be designed to be integral to the landscape.

Park-and-Ride Facilities

Because of limited land availability, there is no space available for the construction of a separate park-and-ride lot or garage. Parking designed to serve other activities in the village center might, however, also be used for park-and-ride purposes.

Several conditions would need to be met for park-and-ride to be successful:

- Adequate parking capacity would need to be available without interfering with the primary purpose of the parking—serving the retail and other uses within the village center. Park-and-ride capacity would need to be designed into any new parking facilities, and park-and-ride use would need to be monitored after construction to ensure it did not reduce parking availability for other purposes.
- Park-and-ride demand must exist at this location. The primary source of this demand would be people who wish to use longer-distance transit services—express buses in the near term and Metrorail when the Dulles Corridor Metrorail Project is in operation. The Wiehle Avenue

Park & Ride now serves this demand and does so more conveniently because of its location at the Dulles Access Road. Only if the Wiehle Avenue Park & Ride and other potential park-and-ride locations did not have sufficient capacity could Lake Anne Village Center be competitive.

- Bus service must be designed to support park-and-ride uses. In the near term, this would require express bus service directly from the village center and in the longer term shuttle service to the Wiehle Avenue or Reston Parkway Metrorail station.
- Parking facility pricing and management must support park-and-ride uses. Parking cost would need to be competitive with other park-and-ride options, and the parking facility would need to be open at times when park-and-ride customers would need it.

Transit Center

A transit center is a focal point for multiple routes. It should be located where routes logically converge to allow transfers, at a major trip destination, or both. The Wiehle Avenue Park & Ride is an example of the former and the Reston Town Center Transit Station of the latter. Transit centers generally should not be too close together because they can require route diversions, transfers, and layovers that add time to passengers' trips.

There is no transit center at Lake Anne Village Center because it is neither a focal point for transit routes nor a major transit destination. Because there are now two transit centers nearby, another one at Lake Anne Village Center would not function well. Redesigning bus routes to focus on Lake Anne Village Center as well as at the existing centers would make the routes less convenient for riders and inefficient to operate. The completion of the Dulles Corridor Metrorail Project will make the existing transit centers even more significant, as both the Wiehle Avenue and Reston Parkway Metrorail stations will be major transfer locations between bus and rail services.

Structured Parking Concepts

The following section describes the parking concepts that were developed. With regard to the terminology used to differentiate the parking schemes from the roadway schemes, the term “concepts” was used for the parking schemes while “options” was used for the various roadway schemes. As with the roadway concepts, the parking concepts are described in more detail in the Assessment and Analysis memo.

Each concept provides underground parking within the limits of the existing parking lot north of Washington Plaza, and though the internal configurations are slightly different, the overall footprint of each concept is similar. While multiple roadway options were developed, each of the parking concepts was based on a single roadway option to avoid the development of an overwhelming number of parking structure designs. Each concept described below was developed assuming that the roadway network surrounding it matched Roadway Option 1A, which includes North Shore Drive on an alignment similar to the existing condition; a new intersection at Village Road and North Shore Drive with Village Road shifted to the west; a slight reconfiguration of the intersection of North Shore Drive with Moorings Drive, Chimney House Road and Cameron Crescent Drive, and no change to the intersection of North Shore Drive with Fellowship Square. Each concept includes access to the parking structure from the east in a location near or similar to the existing east entrance to the parking lot.

Each structure includes elevator and stair towers, located to provide safe egress and generally facing the plaza area; however, the ultimate locations of these structures would have to be coordinated with the development occurring above the parking structure.

As shown in the roadway options, temporary parking can be provided north of North Shore Drive; however, access is shown on the parking concepts for deliveries to the existing businesses and for ADA-accessible parking spaces. This access would probably only be provided during construction, as access to the existing plaza will have to be incorporated into the new development.

For each parking concept, a brief description of the design is provided, along with the provided capacity and order of magnitude cost.

Parking Concept 1:

- **Parking structures in existing parking lot area**
- **Internal ramping system in eastern structure**

This design constructs two parking structures in the area of the existing parking lot north of Washington Plaza. As mentioned previously, two structures are used to straddle the existing box culvert that runs north-south through the project site. Access to the eastern structure is from the east near the existing eastern entrance to the parking lot from North Shore Drive. Access to the western structure is provided from the eastern structure.

The distinguishing feature of this concept is that access from one parking level to the next is provided via an internal ramping system, which provides for an efficient use of space and keeps the area outside the main structure footprint free of ramps. A graphic of a typical middle level of this parking structure is shown below.



Figure 11 – Parking Concept 1

Parking Concept 1, continued:

Specific design features of Concept 1 include:

- Eastern parking structure, constructed east of the existing box culvert
 - Entrance road into structure from North Shore Drive near existing parking lot entrance
 - At grade level and first underground parking level (level 1), assumes retail fronting plaza with two parking bays behind the retail; there is no vehicular connection under the plaza at level 1; however, there would be sufficient space for a underground connection for pedestrians, utilities, deliveries, etc.
 - Parking level 2 assumes three bays, with no connections to the western garage.
 - Parking levels 3 and 4 assume three bays each, with connections to the corresponding level in the western garage.
 - Access from one level to the next is provided via the sloped center bay, which will be at a maximum slope of 6% to allow for parking on the ramp.
 - Due to the internal ramping system, providing access to the rear of the grade-level businesses fronting the plaza will be difficult.
- Western structure
 - This structure is accessed only from the eastern parking structure.
 - The western structure only has parking on levels 3 and 4, and no access between levels 3 and 4 is provided within the structure.

Number of parking spaces provided: 900 spaces

This number of parking spaces is based on the configuration described above, with five levels in the eastern structure and two levels in the western structure.

Conceptual cost: \$37.8 million

A description of the development of the conceptual cost is provided in the Assessment and Analysis memo, including the cost per level of parking.

Average cost per space: \$42,000

Parking Concept 1A:

- **Parking structures in existing parking lot area**
- **Internal ramping system in eastern and western structures**

This option also constructs two parking structures in the area of the existing parking lot north of Washington Plaza, and access to the structure is from the east near the existing eastern entrance to the parking lot. This option is similar to Concept 1; however, the eastern garage is larger and provides an internal speed ramp system. A graphic of a typical middle level of this parking structure is shown below.



Figure 12 – Parking Concept 1A

More specifically, the differences between Concept 1A and Concept 1 include:

- Eastern parking structure, constructed east of the existing box culvert
 - No changes from Concept 1
- Western structure
 - The lower levels of this structure are accessed only from the eastern parking structure.
 - The western structure only has parking on levels 2, 3 and 4. Access between these levels is provided within the structure via an internal speed ramp. This ramp would serve only to provide access between levels and would not include any parking spaces on the ramp itself.

Parking Concept 1A, continued:

Number of parking spaces provided: 1033 spaces

This number of parking spaces is based on the configuration described above, with five levels in the eastern structure and three levels in the western structure.

Conceptual cost: \$45.1 million

A description of the development of the conceptual cost is provided in the Assessment and Analysis memo, including the cost per level of parking.

Average cost per space: \$43,600

Parking Concept 2:

- Parking structures in existing parking lot area
- External ramping system in eastern structure
- Internal ramping system in western structure

Similar to the previous two concepts, this design constructs two parking structures in the area of the existing parking lot north of Washington Plaza. Access to the eastern structure is from the east near the existing eastern entrance to the parking lot from North Shore Drive. Access to the western structure is provided from the eastern structure.

The distinguishing feature of this concept is that access from one parking level to the next is provided via an external speed ramp system for the eastern structure and an internal speed ramp system for the western structure. Similar to Concept 1A, a speed ramp in the western structure provides access from level to level, with no parking on the ramp itself. The speed ramp for the eastern structure is located outside the main footprint of the structure on the eastern side of the structure. This system allows for all parking levels to be flat bays, thus increasing the parking efficiency of the structure within the main footprint of the structure. However, circulation throughout the eastern structure would be less efficient than in the previous two concepts due to the need for vehicles to travel to the eastern edge of the structure to move from level to level. A graphic of a typical middle level of this parking structure is shown below.



Figure 13 – Parking Concept 2

Parking Concept 2, continued:

Specific design features of Concept 2 include:

- Eastern parking structure, constructed east of the existing box culvert
 - Entrance road into structure from North Shore Drive south of existing parking lot entrance
 - At grade level, assumes retail fronting plaza with two parking bays behind the retail; there is no vehicular connection under the plaza at level 1; however, there would be sufficient space for an underground connection for pedestrians, utilities, deliveries, etc.
 - Parking level 1 assumes three bays, with no connections to the western garage.
 - Parking levels 2 and 3 assume three bays each, with connections to the corresponding level in the western garage.
 - Access from one level to the next is provided via a speed ramp located east of the structure, which will be at a maximum slope of 10%. There is no parking on the speed ramp.
 - Due to the external ramping system on the eastern structure and resulting flat bays, providing access to the rear of the grade-level businesses fronting the plaza may be feasible. Access to this level is provided directly from North Shore Drive without having to navigate the speed ramp, so if the clear height to the development above is set high enough, access for deliveries may be feasible. This will, however, decrease the number of spaces provided.
- Western structure
 - The lower levels of this structure are accessed only from the eastern parking structure.
 - The western structure only has parking on levels 1, 2 and 3. Access between these levels is provided within the structure via an internal speed ramp.

Number of parking spaces provided: 958 spaces

This number of parking spaces is based on the configuration described above, with four levels in the eastern structure and three levels in the western structure.

Conceptual cost: \$37.9 million

A description of the development of the conceptual cost is provided in the Assessment and Analysis memo, including the cost per level of parking.

Average cost per space: \$39,600

Other Parking Concepts Considered

Four bay eastern garage

Initial concepts for the eastern parking garage included a four bay structure, which extended the garage shown in Concepts 1 and 1A to the east by one bay, or approximately 60 feet. This extension was assumed to apply to only the underground levels; however, due to a significant encroachment into the North Shore Drive right-of-way, the associated utility and property impacts, and constrained access points this option was not considered feasible.

Above ground parking on site

Due to the nature of the potential development envisioned for the existing parking area and the restricted size of that area, it was felt that above ground parking on the project site would greatly limit the development options and was not considered feasible.

Above ground parking north of North Shore Drive

With the proposed relocation of Village Road to the west, an above ground structure could be provided in the area currently occupied by Village Road and the land immediately to the east of that area. There were concerns with providing access to a garage in this location from North Shore Drive given the proximity of the intersection with Village Road and the entrance to the existing parking area (and most likely future access to the redeveloped site), and the limited sight distance along North Shore Drive. Structured parking in this location could be provided as part of the redevelopment of the Crescent property, with access to the garage potentially from that site as opposed to from North Shore Drive or Baron Cameron Avenue.

Concepts including a relocated box culvert

The presence of the large concrete box culvert and nearby sanitary sewer line running through the center of the existing parking area limited the potential configurations for underground parking structures; however, there are limited locations to which that culvert could be relocated. During the reconstruction of the existing site, a developer may choose to take on the expense of relocating this culvert or incorporating it into the utility and drainage system for the new facilities, which would potentially allow for a more efficient underground parking design. However, it was felt that it was a more conservative approach to design the parking assuming this structure remained in place.

Roof level parking on western garage

The elevation of the plaza for the new site was originally assumed to match the existing plaza elevation of approximately 334'; however, later designs for the site raised this elevation approximately 10' to provide better access and visibility to North Shore Drive and Village Road. When the plaza was at 334', parking on the roof of the plaza-level retail space (with building above) with access provided from Washington Plaza North was a possibility. With the higher plaza elevation, the grade from Washington Plaza North to the higher "roof" level would be too steep, so this concept was not carried forward.

RECOMMENDATIONS

The following sections provide recommendations regarding the future transportation network and potential transit changes, and a discussion of the positive and negative aspects of each parking structure concept.

Transportation

Four options were developed and assessed during this study. Options 1A and 1B would only slightly change the existing street network, whereas Options 2A and 2B would add a new intersection and greatly realign North Shore Drive.

The options were compared against several qualitative transportation measures. All four of the options would perform similarly with regards to traffic operations, bicycle and pedestrian circulation, overall safety, and bus circulation. Options 2A and 2B, with a new intersection, would require significant regrading while not providing major benefits above Options 1A and 1B. In addition, both Option 2 versions would place limitations on the development site plan by realigning North Shore Drive. This internal circulation may be desirable, but should be designed as part of the redevelopment. For these reasons, Options 2A and 2B are not recommended.

The only difference between Options 1A and 1B are the roundabouts (in Option 1B) along North Shore Drive at Fellowship Square and Village Road. The matrix below compares the two intersection configurations at North Shore Drive and Village Road.

Stop-signed control at Village/North Shore		Roundabout at Village/North Shore	
<i>Pro</i>	<i>Con</i>	<i>Pro</i>	<i>Con</i>
Requires less right-of-way	All traffic must stop, increasing vehicle delays and carbon emissions	Reduced stops or delays for overall intersection (particularly for inbound vehicles) compared to a stop control	Requires more right-of-way
Vehicles always required to stop for pedestrians	Traffic could back up Baron Cameron Avenue under peak conditions*	Would create a visual anchor from Village Road to the extended plaza	Vehicles must yield to pedestrians
Diver familiarity			Less driver familiarity

*This is estimated to occur less than five percent of the time.

The large forecasted PM peak hour southbound left-turn volume from Village Road to North Shore Drive would be a problem for either intersection configuration, particularly under the stop control in Option 1A. This is because of the short (approximately 200 feet) distance to the Baron Cameron Avenue intersection. However, either intersection configuration's traffic impacts could be mitigated by allowing the inbound movement from Baron Cameron Avenue to be free-flow, whether by intersection signage in Option 1A or design and operations of roundabout in Option 1B.

Because the two intersection configurations at North Shore Drive and Village Road operate similarly among many operational measures, the roundabout is recommended due to its urban design context and its superior traffic flow benefits in non-peak periods. Therefore, Option 1B is recommended to best accommodate a redeveloped Lake Anne Village Center.

Recommended Transportation Network

As previously described, the recommendation is to slightly change the existing street alignments, allowing development and parking within the existing parking lot area. Specifically, the recommendation includes:

- Realigned Village Road to line up with Washington Plaza entrance.
- Slight realignment of North Shore Drive, to the east of Village Road, to smooth out the horizontal curve and improve sight distance.
- Reconfiguration of North Shore Drive, in the vicinity of Washington Plaza, to include one travel lane in each direction, a bike lane in each direction, and six-foot wide sidewalks on either side. Because of this change, the existing on-street parking would be removed. Parking would instead be accommodated in the new structure.
- A roundabout at the intersections of North Shore Drive with Village Road.¹ A roundabout would improve traffic operations by providing more efficient flows, particularly for southbound Village Road traffic destined for eastbound North Shore Drive.
- A shared ingress and egress point to the parking structure on North Shore Drive, southeast of the Village Road intersection.



Figure 14 – Recommended Roadway Option

¹ In the previous section, Option 1B also included a roundabout at North Shore Drive and Fellowship Square, however, this configuration had limited benefits and is therefore not recommended.

The recommended option also includes some mitigation measures to reduce traffic delay and queuing associated with the development presented in the BBPA report. These changes include:

- Optimization of traffic signals in the study area
- Reconfiguration of the North Shore Drive and Wiehle Avenue intersection so that the eastbound approach includes one shared left/through/right lane and one right-turn only lane
- Reconfiguration of the Village Road and Baron Cameron Avenue intersection so that the northbound approach includes two left-turn only lanes and one shared through/right lane. This would reduce the queues towards the North Shore Drive intersection.

Other mitigation, such as additional turning lanes at intersections, would further improve traffic flow and could be investigated in future studies. For example, adding a lane to North Shore Drive at both the west and eastbound approaches to Wiehle Avenue could measurably decrease intersection delays, however, this could require additional right-of-way.

The recommended roadway network has many positive multimodal impacts. A new bike lane would be added along sections of North Shore Drive, providing a more direct route than the existing off-street paths. Widened sidewalks would be added, particularly near bus stops. The transit recommendations and benefits are discussed further in the next section.

Traffic operations with the recommended roadway network are shown in Table 2, which assumes the BBPA development levels. The roundabout results require a special discussion. Many traffic software packages do not adequately model roundabouts; for that reason, a separate analysis was done using SIDRA. This more sophisticated analysis showed that the roundabout would operate at acceptable LOS and have manageable queues.

For comparison purposes, Table 1 shows the 2030 No Build traffic operations assuming no development at Lake Anne Village Center. Additionally, the Appendix includes tables showing traffic operations with various combinations development scenarios (BBPA and Charrette) and roadway network scenarios (Recommended and Option 1A). Because the Charrette development scenario assumes less overall office and residential development, the traffic operations are generally better.

Table 1. 2030 No Build Traffic Operations without Development

Intersection		Approach			
		NB	SB	EB	WB
AM					
Baron Cameron Ave. / Village Rd.	Delays	45.6 (D)	47.2 (D)	19.1 (B)	13.4 (B)
		20.2 (C)			
	Queues	173	44	668	505
North Shore Dr. / Village Rd.	Delays		3.6 (A)	6.0 (A)	5.4 (A)
		4.9 (A)			
	Queues		77	75	74
North Shore Dr. / Wiehle Ave.	Delays	20.8 (C)	66.1 (E)	63.1 (E)	86.1 (F)
		59.0 (E)			
	Queues	172	797	163	794
Wiehle Ave. / Baron Cameron Rd.	Delays	55.3 (E)	63.9 (E)	32.8 (C)	50.3 (D)
		50.6 (D)			
	Queues	359	733	660	405
North Shore Dr. / Fellowship Sq	Delays	9.5 (A)	9.5 (A)	17.8 (B)	31.2 (C)
		10.5 (B)			
	Queues	236	240	36	26
PM					
Baron Cameron Ave. / Village Rd.	Delays	45.6 (D)	53.6 (D)	16.3 (B)	12.0 (B)
		17.4 (B)			
	Queues	173	36	606	667
North Shore Dr. / Village Rd.	Delays		2.9 (A)	7.1 (A)	6.1 (A)
		5.4 (A)			
	Queues		68	103	76
North Shore Dr. / Wiehle Ave.	Delays	23.7 (C)	40.3 (D)	59.4 (E)	106.3 (F)
		34.9 (C)			
	Queues	1031	330	138	332
Wiehle Ave. / Baron Cameron Rd.	Delays	90.5 (F)	44.3 (D)	42.5 (D)	75.7 (E)
		69.2 (E)			
	Queues	938	275	508	786
North Shore Dr. / Fellowship Sq	Delays	9.5 (A)	9.5 (A)	17.8 (B)	31.2 (C)
		10.5 (B)			
	Queues	236	240	36	26

Notes:

1. Signalized intersections have been optimized in Synchro.
2. Transplan volumes provided by Fairfax County DOT.
3. North Shore Dr. / Village Road was analyzed as an isolated intersection by SimTraffic

Table 2. 2030 Recommended Roadway Network Traffic Operations with BBPA Development

Intersection		Approach			
		NB	SB	EB	WB
AM					
Baron Cameron Ave. / Village Rd.	Delays	41.5 (D)	49.4 (D)	23.5 (C)	19.7 (B)
		25.7 (C)			
North Shore Dr. / Village Rd.	Queues	241	50	750	521
North Shore Dr. / Wiehle Ave.	Delays		14.2 (B)	13.0 (B)	28.9 (D)
		21.3 (C)			
North Shore Dr. / Wiehle Ave.	Queues		N/A	N/A	N/A
Wiehle Ave. / Baron Cameron Rd.	Delays	19.3 (B)	95.6 (F)	122.9 (F)	110.3 (F)
		85.0 (F)			
Wiehle Ave. / Baron Cameron Rd.	Queues	165	824	451	840
North Shore Dr. / Fellowship Sq	Delays	61.8 (E)	69.4 (E)	33.1 (C)	55.9 (E)
		54.6 (D)			
North Shore Dr. / Fellowship Sq	Queues	356	768	677	426
North Shore Dr. / Fellowship Sq	Delays	9.5 (A)	9.5 (A)	17.8 (B)	31.2 (C)
		10.5 (B)			
North Shore Dr. / Fellowship Sq	Queues	236	240	36	26
PM					
Baron Cameron Ave. / Village Rd.	Delays	44.7 (D)	53.1 (D)	20.6 (C)	18.1 (B)
		23.4 (C)			
North Shore Dr. / Village Rd.	Queues	257	34	673	703
North Shore Dr. / Village Rd.	Delays		37.7 (E)	26.4 (D)	104.0 (F)
		62.3 (F)			
North Shore Dr. / Wiehle Ave.	Queues		N/A	N/A	N/A
North Shore Dr. / Wiehle Ave.	Delays	34.5 (C)	48.9 (D)	82.6 (F)	111.3 (F)
		47.1 (D)			
Wiehle Ave. / Baron Cameron Rd.	Queues	1060	461	284	380
Wiehle Ave. / Baron Cameron Rd.	Delays	97.9 (F)	44.9 (D)	47.4 (D)	75.9 (E)
		72.4 (E)			
North Shore Dr. / Fellowship Sq	Queues	914	276	526	786
North Shore Dr. / Fellowship Sq	Delays	9.5 (A)	9.5 (A)	17.8 (B)	31.2 (C)
		10.5 (B)			
North Shore Dr. / Fellowship Sq	Queues	236	240	36	26

Notes:

1. Signalized intersections have been optimized in Synchro.
2. For the EB approach to North Shore Drive and Wiehle Avenue, the thru-left turn lane was changed to a shared thru-left turn-right turn lane.
3. The NB approach to Baron Cameron Avenue and Village Road was changed to two left turn lanes and one thru-right turn lane
4. The roundabout results are reported from the HCS output. A separate SIDRA analysis was performed, however. SIDRA reported LOS A for both AM and PM peak hours. According to SIDRA, the largest queues would form in the PM peak, with backups approximately 225 feet to the east.

Transit Facilities

There are some transit facilities that should be improved in the near-term, and some that should be improved as part of the Lake Anne Village Center redevelopment. In the near-term, bus shelters with expanded transit information should be added. In addition, the bus stops along North Shore Drive between Village Road and Cameron Crescent Drive should be relocated or consolidated with nearby stops. The RIBS 1 and 2 bus stops that service Lake Anne Village Center should be redesigned as part of the redevelopment; how buses service the center will depend upon the future site plan.

A park-and-ride facility should be considered only if adequate parking supply could be provided and if the Wiehle Avenue Park & Ride exceeded capacity. These conditions are unlikely, but further analysis would be necessary to determine whether this would be possible.

A transit center should not be developed in Lake Anne. Because there are now two transit centers nearby, a new one would not function well. In addition, Lake Anne is neither a focal point for transit nor a major transit destination. Even with significant redevelopment, Lake Anne will not be a major destination like nearby sites such as the Reston Town Center.

Parking

As discussed previously, the ultimate design for underground structured parking at the Lake Anne Village Center would have to be developed in conjunction with the design of the new development to be constructed above the facility. For this reason, recommending one parking concept over another would be premature at this stage of the project. However, while they are similar, each parking concept has associated opportunities and challenges, some of which are summarized below.

Parking Concepts 1 and 1A

The key feature of these two parking concepts is the internal ramping system. The ramped center bay in the eastern garage allows for an efficient flow of vehicles from one level to the other and contains the level-to-level movement of vehicles within the footprint of the main parking structure. This keeps the area outside the main structure clear of vehicular ramps and provides a cleaner interface between the structure, the buildings above it, and the pedestrian facilities along the roadways surrounding the structure.

A drawback of this system is that, at the grade level of the structure, the sloped center bay is located directly behind the retail area that fronts the new promenade and this bay can only be accessed by vehicles progressing through the garage. This limits access for delivery trucks and will make deliveries to the rear of the establishments fronting the promenade more difficult. However, this situation is similar to the existing access to the businesses currently located on Washington Plaza, for while there is a loading dock off the existing parking area, deliveries to the rear of the businesses fronting the existing plaza are still made via hand trucks.

Keeping the center bay at a shallow enough slope to allow parking on the ramp is critical and increases the parking capacity of the garage. Due to the limited size of the project site and the space constraints imposed by the existing box culvert, a north-south orientation of the parking bays is required, and the distance along these bays is limited by the existing buildings at the south end of the site and by North Shore Drive at the north end. This limitation, combined with a 12' floor-to-floor height, requires a 6% slope on the ramped bays, which while still acceptable for on-ramp parking, is higher than the preferred 5% slope. The 12' floor-to-floor height was assumed because a more structurally-robust structure may be required to support the development above; however, as part of the ultimate design of the facility, if a shorter floor-to-floor height is used, the slope of any ramped parking bays will most likely be reduced.

The smaller western garage in Concept 1 results in a lower cost and less construction on the west side of the project site; however, it decreases the overall capacity and efficiency of the structure due to the lack of access between parking levels. This lack of access limits the western structure's parking levels to those that can be accessed from the eastern structure – levels 3 and 4 as described previously.

In Concept 1A, the larger western structure allows for a speed ramp within the garage that provides movement between levels. While the larger size increases the cost and footprint of the western garage, it allows for parking on one more level and provides for a more efficient flow of vehicles within the western structure and between the eastern and western structures.

With respect to capacity and cost, Parking Concept 1 provides for the smallest capacity at 900 spaces for the lowest cost at \$37.8 million. Parking Concept 1A, while the most expensive at \$45.1 million, also provides the highest capacity with 1033 spaces.

Parking Concept 2

The key features of this concept are the flat bays provided in both the eastern and western structures via the use of speed ramps for floor-to-floor access instead of sloped bays. The western structure is basically identical to the western structure described in Concept 1A, with an internal speed ramp providing access between the levels. The eastern structure, however, has flat bays on all levels and an external speed ramp system that provides floor-to-floor access. An advantage of this system is that flat parking levels simplify the structural design of the garage and also make access to the rear of the businesses fronting the promenade more feasible, assuming that a sufficient level of vertical clearance is provided above the grade level of the structure. Flat bays also provide for a very efficient garage from a capacity standpoint, since the entire area of each level can be used for parking, whereas the area under the sloped bay is lost on the bottom level the structure in Concepts 1 and 1A.

A drawback to the use of an external speed ramp system is that the flow of vehicles through the parking structure is less efficient. A vehicle wishing to move from one level to the next has to travel to the eastern end of the garage to access the ramp system as opposed to being able to access a sloped center ramp from either the east or west bays in the previous concept. Another constraint imposed by the external speed ramp system is that the area to the east of the new structure will be occupied by vehicular ramps, which may negatively impact pedestrian access and will limit the frontage of the new buildings on that portion of North Shore Drive. However, as mentioned previously, any number of parking designs are possible when the design of the garage is done in conjunction with the development above, so opportunities for an internal speed ramp system in the eastern structure certainly exist. Providing such an internal system while maintaining the flat bays could combine the clean outer footprint of Concepts 1 and 1A with the flat bays of Concept 2 and provide for a more efficient vehicular flow.

With respect to capacity and cost, Parking Concept 2 provides a capacity that falls between that of the other two concepts at 958 spaces; however, it does so at a cost similar to Concept 1 at \$37.9 million.

Interface of Parking Concepts with Recommended Transportation Option

As discussed previously, to simplify the development of the parking concepts, a single transportation option was used as the base – in this case Option 1A, which maintained much of North Shore Drive in a similar location to the existing roadway and provided a T-intersection at North Shore Drive and Village Road. However, as described above, the transportation option recommended at the conclusion of this study is Option 1B, which is similar to 1A, but provides a roundabout at the intersection of North Shore Drive and Village Road.

Choosing this option has a minor impact on the footprint of the parking structures due to the greater encroachment into the existing parking lot by the roundabout as opposed to the intersection. Each eastern parking structure design already included an easternmost bay that was shorter than the other bays by approximately 20', and this was done due to the proximity of North Shore Drive in the northeast corner of the project site. Due to the proximity of the roundabout to the new parking structures, this reduction in length would now be carried across the entire northern edge of both the eastern and western parking structures, effectively shortening the north-south length of the structures by 20', similar to the length already shown for the easternmost bay of the eastern garage in each original parking concept. This change would have no impact on the slope of the ramped bay in Concepts 1 and 1A or the speed ramps in Concepts 1A and 2.

Shortening the structures also necessitates the relocation of the stair tower from the northwest corner of each eastern parking structure to a point near the northwest corner but within the structure itself. Since this stair tower would be designed as part of the overall development and accommodated within the building above the parking structure, this change is minor.

Shortening the structures will decrease the number of spaces provided by each concept. The new overall capacities of the structures in Concepts 1, 1A and 2 are 841, 990 and 899 respectively. There could also be a reduction in the overall cost of each concept, though the difference would not be significant and, at this level of design, the order of magnitude costs provided earlier should still be valid.

Graphics showing the new parking structure concepts described above are provided in the Appendix.

APPENDIX

2030 Tranplan Traffic Volumes

2030 Tranplan Traffic Volumes – Modified for the Charrette Scenario

2030 Tranplan Traffic Volumes – Modified for the BBPA Development (“Option 2”) Scenario

2030 Recommended Roadway Network Traffic Operations with Charrette Development

2030 Option 1A Roadway Network Traffic Operations with BBPA Development

2030 Option 1A Roadway Network Traffic Operations with Charrette Development

Recommended Roadway Option

Parking Concept 1 – Grade Level

Parking Concept 1 – Typical Middle Level

Parking Concept 1 – Typical Bottom Level

Parking Concept 1A – Grade Level

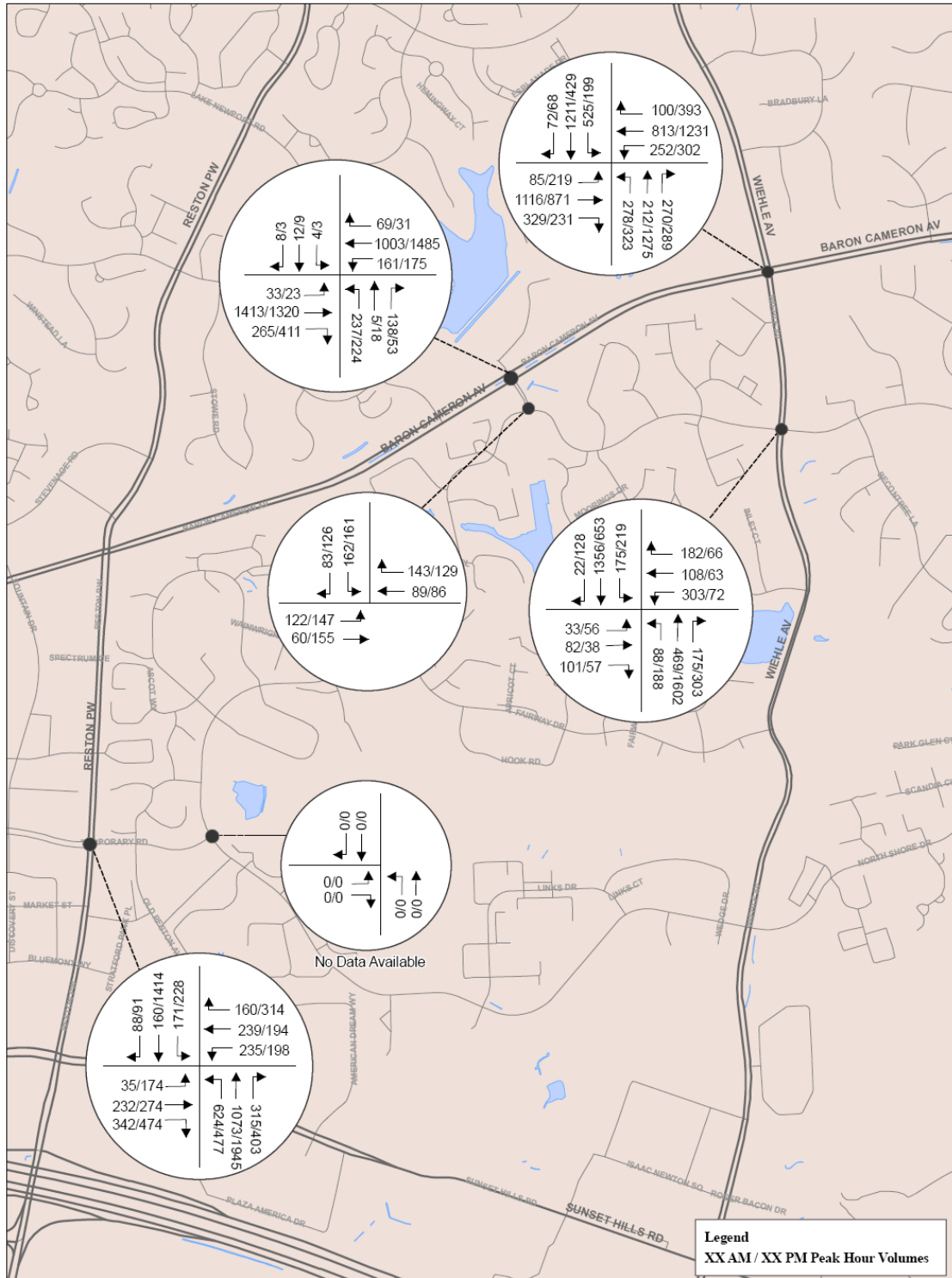
Parking Concept 1A – Typical Middle Level

Parking Concept 1A – Typical Bottom Level

Parking Concept 2 – Grade Level

Parking Concept 2 – Typical Middle Level

Parking Concept 2 – Typical Bottom Level



2030 TRANPLAN TRAFFIC VOLUMES

Source: Calculated Volumes using FFX County Model

12/10/07

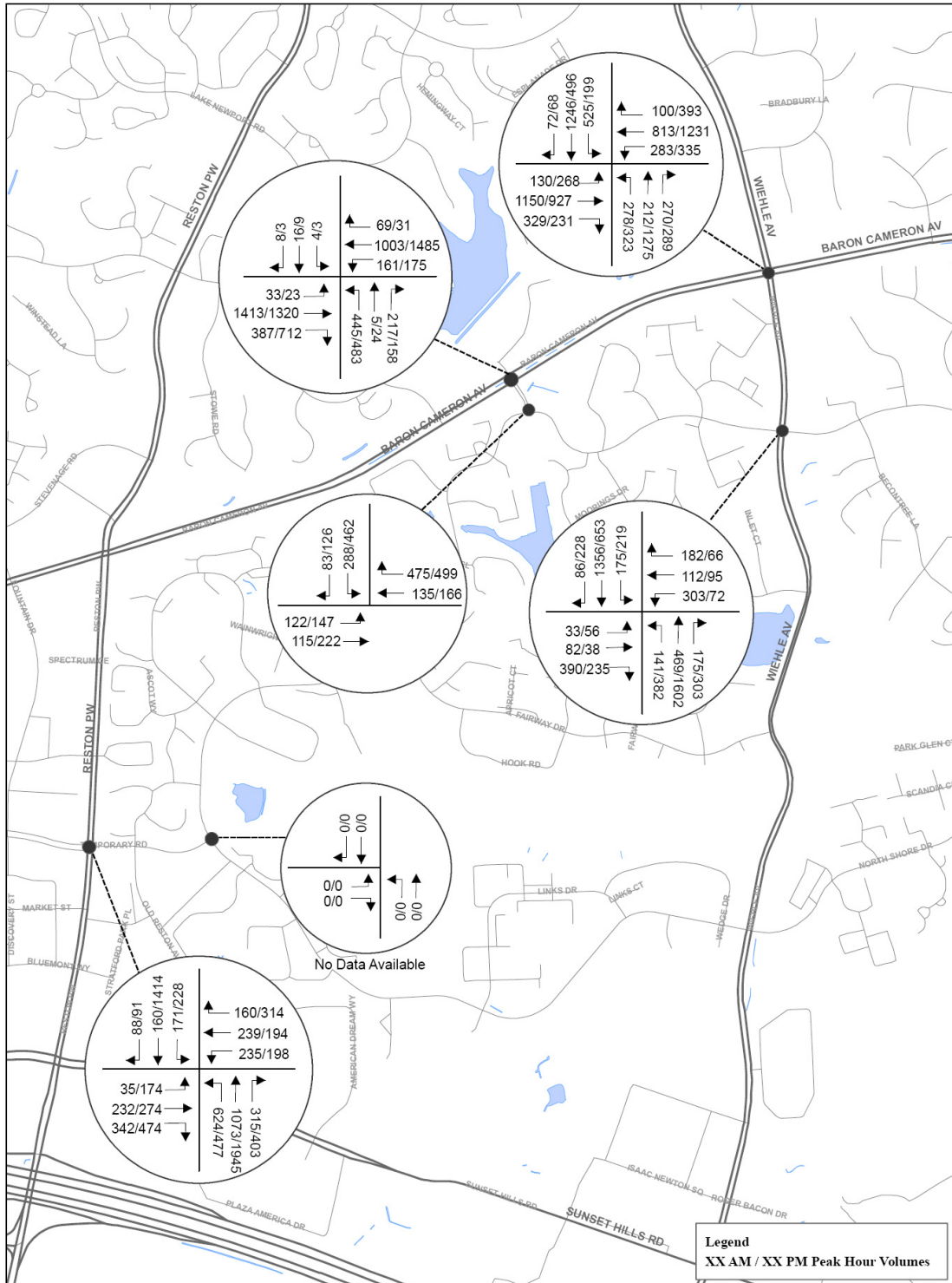


2030 TRANPLAN TRAFFIC VOLUMES

Modified for the Charrette scenario

Source: Calculated Volumes using FFX County Model

3/28/08



2030 TRANPLAN TRAFFIC VOLUMES

Modified for the Option 2 scenario

Source: Calculated Volumes using FFX County Model

3/28/08

2030 Recommended Roadway Network Traffic Operations with Charrette Development

Intersection		Approach			
		NB	SB	EB	WB
AM					
Baron Cameron Ave. / Village Rd.	Delays	43.9 (D)	47.2 (D)	21.1 (C)	16.3 (B)
		22.9 (C)			
	Queues	195	44	696	502
North Shore Dr. / Village Rd.	Delays		10.4 (B)	10.5 (B)	12.5 (B)
		11.4 (B)			
	Queues		N/A	N/A	N/A
North Shore Dr. / Wiehle Ave.	Delays	18.0 (B)	70.7 (E)	91.9 (F)	92.6(F)
		64.7 (E)			
	Queues	165	770	324	806
Wiehle Ave. / Baron Cameron Rd.	Delays	62.7 (E)	72.3 (E)	27.7 (C)	53.0 (D)
		53.5 (D)			
	Queues	361	760	638	401
North Shore Dr. / Fellowship Sq	Delays	9.5 (A)	9.5 (A)	17.8 (B)	31.2 (C)
		10.5 (B)			
	Queues	236	240	36	26
PM					
Baron Cameron Ave. / Village Rd.	Delays	48.3 (D)	53.1(D)	17.5 (B)	14.0 (B)
		19.6 (B)			
	Queues	192	34	627	677
North Shore Dr. / Village Rd.	Delays		14.5 (B)	16.0 (C)	16.2 (C)
		15.5 (C)			
	Queues		N/A	N/A	N/A
North Shore Dr. / Wiehle Ave.	Delays	23.9 (C)	40.9 (D)	66.6 (E)	106.3 (F)
		36.1 (D)			
	Queues	1034	351	183	332
Wiehle Ave. / Baron Cameron Rd.	Delays	90.7 (F)	44.3 (D)	49.4 (D)	74.8 (E)
		70.2 (E)			
	Queues	938	275	550	786
North Shore Dr. / Fellowship Sq	Delays	9.5 (A)	9.5 (A)	17.8 (B)	31.2 (C)
		10.5 (B)			
	Queues	236	240	36	26

Notes:

1. Signalized intersections have been optimized in Synchro.
2. For the EB approach to North Shore Drive and Wiehle Avenue, the thru-left turn lane was changed to a shared thru-left turn-right turn lane.
3. The NB approach to Baron Cameron Avenue and Village Road was changed to two left turn lanes and one thru-right turn lane
4. Roundabout was analyzed with HCS

2030 Option 1A Roadway Network Traffic Operations with BBPA Development

Intersection		Approach			
		NB	SB	EB	WB
AM					
Baron Cameron Ave. / Village Rd.	Delays	41.5 (D)	49.4 (D)	23.5 (C)	19.7 (B)
		25.7 (C)			
	Queues	241	50	750	521
North Shore Dr. / Village Rd.	Delays		5.6 (A)	6.8 (A)	16.5 (C)
		11.3 (B)			
	Queues		116	98	283
North Shore Dr. / Wiehle Ave.	Delays	19.3 (B)	95.6 (F)	122.9 (F)	110.3 (F)
		85.0 (F)			
	Queues	165	824	451	840
Wiehle Ave. / Baron Cameron Rd.	Delays	61.8 (E)	69.4 (E)	33.1 (C)	55.9 (E)
		54.6 (D)			
	Queues	356	768	677	426
North Shore Dr. / Fellowship Sq	Delays	9.5 (A)	9.5 (A)	17.8 (B)	31.2 (C)
		10.5 (B)			
	Queues	236	240	36	26
PM					
Baron Cameron Ave. / Village Rd.	Delays	44.7 (D)	53.1 (D)	20.6 (C)	18.1 (B)
		23.4 (C)			
	Queues	257	34	673	703
North Shore Dr. / Village Rd.	Delays		13.6 (B)	13.3 (B)	40.9 (E)
		24.5 (C)			
	Queues		230	159	596
North Shore Dr. / Wiehle Ave.	Delays	34.5 (C)	48.9 (D)	82.6 (F)	111.3 (F)
		47.1 (D)			
	Queues	1060	461	284	380
Wiehle Ave. / Baron Cameron Rd.	Delays	97.9 (F)	44.9 (D)	47.4 (D)	75.9 (E)
		72.4 (E)			
	Queues	914	276	526	786
North Shore Dr. / Fellowship Sq	Delays	9.5 (A)	9.5 (A)	17.8 (B)	31.2 (C)
		10.5 (B)			
	Queues	236	240	36	26

Notes:

1. Signalized intersections have been optimized in Synchro
2. For the EB approach to North Shore Drive and Wiehle Avenue, the thru-left turn lane was changed to a shared thru-left turn-right turn lane
3. The NB approach to Baron Cameron Avenue and Village Road was changed to two left turn lanes and one thru-right turn lane
4. North Shore Drive and Village Road was analyzed with SimTraffic as an isolated intersection

2030 Option 1A Roadway Network Traffic Operations with Charrette Development

Intersection		Approach			
		NB	SB	EB	WB
AM					
Baron Cameron Ave. / Village Rd.	Delays	43.9 (D)	47.2 (D)	21.1 (C)	16.4 (B)
		22.9 (C)			
	Queues	195	44	696	502
North Shore Dr. / Village Rd.	Delays		3.8 (A)	6.3 (A)	8.5 (A)
		6.4 (A)			
	Queues		82	80	153
North Shore Dr. / Wiehle Ave.	Delays	18.0 (B)	71.2 (E)	91.9 (F)	92.6 (F)
		65.0 (E)			
	Queues	165	770	324	806
Wiehle Ave. / Baron Cameron Rd.	Delays	61.8 (E)	72.3 (E)	27.7 (C)	53.0 (D)
		53.4 (D)			
	Queues	361	760	638	401
North Shore Dr. / Fellowship Sq	Delays	9.5 (A)	9.5 (A)	17.8 (B)	31.2 (C)
		10.5 (B)			
	Queues	236	240	36	26
PM					
Baron Cameron Ave. / Village Rd.	Delays	48.3 (D)	53.3 (D)	17.2 (B)	13.9 (B)
		19.4 (B)			
	Queues	192	34	621	676
North Shore Dr. / Village Rd.	Delays		5.3 (A)	9.6 (A)	8.9 (A)
		7.7 (A)			
	Queues		116	165	137
North Shore Dr. / Wiehle Ave.	Delays	23.9 (C)	40.4 (D)	66.6 (E)	106.3 (F)
		36.0 (D)			
	Queues	1034	352	183	332
Wiehle Ave. / Baron Cameron Rd.	Delays	90.7 (F)	45.2 (D)	49.6 (D)	74.8 (E)
		70.4 (E)			
	Queues	938	280	550	786
North Shore Dr. / Fellowship Sq	Delays	9.5 (A)	9.5 (A)	17.8 (B)	31.2 (C)
		10.5 (B)			
	Queues	236	240	36	26

Notes:

1. Signalized intersections have been optimized in Synchro
2. For the EB approach to North Shore Drive and Wiehle Avenue, the thru-left turn lane was changed to a shared thru-left turn-right turn lane
3. The NB approach to Baron Cameron Avenue and Village Road was changed to two left turn lanes and one thru-right turn lane
4. North Shore Drive and Village Road was analyzed with SimTraffic as an isolated intersection



PARKING SUMMARY
GRADE LEVEL
ELEVATION 344
113 SPACES

LEVEL 1 (SIMILAR)
ELEVATION 332
110 SPACES



PARKING SUMMARY
LEVEL 2
ELEVATION 320
162 SPACES



PARKING SUMMARY	
LEVEL 3	
ELEVATION 308	
156 SPACES (EAST)	
91 SPACES (WEST)	
LEVEL 4	
ELEVATION 296	
117 SPACES (EAST)	
91 SPACES (WEST)	

CONNECTION BETWEEN
EAST AND WEST STRUCTURES

STAIRS

STAIRS AND
ELEVATOR

STAIRS AND ELEVATOR

CONNECTION BETWEEN
EAST AND WEST STRUCTURES

LAKE ANNE VILLAGE CENTER
PARKING AND TRANSPORTATION STUDY

PARKING CONCEPT 1
TYPICAL BOTTOM LEVEL

SCALE: 1" = 50'

AUGUST 2008

PARKING SUMMARY
GRADE LEVEL
ELEVATION 344
113 SPACES

LEVEL 1 (SIMILAR)
ELEVATION 332
110 SPACES



PARKING SUMMARY
LEVEL 2
ELEVATION 320
162 SPACES (EAST)
110 SPACES (WEST)





PARKING SUMMARY	
LEVEL 3	
ELEVATION 308	
156 SPACES (EAST)	
110 SPACES (WEST)	
LEVEL 4	
ELEVATION 296	
117 SPACES (EAST)	
110 SPACES (WEST)	

PARKING SUMMARY
GRADE LEVEL
ELEVATION 334
110 SPACES



LAKE ANNE VILLAGE CENTER
PARKING AND TRANSPORTATION STUDY
PARKING CONCEPT 2
GRADE LEVEL

SCALE: 1" = 50'

AUGUST 2008

PARKING SUMMARY
LEVEL 1
ELEVATION 322
155 SPACES (EAST)
111 SPACES (WEST)



LAKE ANNE VILLAGE CENTER
PARKING AND TRANSPORTATION STUDY
PARKING CONCEPT 2
MIDDLE LEVEL
SCALE: 1" = 50'
AUGUST 2008



PARKING SUMMARY	
LEVEL 2	
ELEVATION 310	
149 SPACES (EAST)	
111 SPACES (WEST)	
LEVEL 3	
ELEVATION 298	
152 SPACES (EAST)	
111 SPACES (WEST)	

LAKE ANNE VILLAGE CENTER
PARKING AND TRANSPORTATION STUDY

PARKING CONCEPT 2
TYPICAL BOTTOM LEVEL

SCALE: 1" = 50'

AUGUST 2008